



Work instructions for the use of isofluorane for animal anesthesia at the Technion

1. Background

- 1.1. Isofluorane belongs to the volatile anesthetics (halogenated anesthetics) family that is very efficient in the anesthesia of animals without causing adverse affects.
- 1.2. For this reason, the use of these anesthetics is widely used in research protocols that involve laboratory animals at the Technion.
- 1.3. The risk of overexposure of researchers/ staff is mainly due to inhalation of waste gases released to the environment during anesthesia (involuntary).
- 1.4. Acute and/ or chronic health effects due to exposure to anesthetic gas might include amongst other:
 - 1.4.1. Immediate effects: drowsiness, irritability, depression, headache, dizziness, nausea, coordination problems, speech and sight problems and reduced mental performance.
 - 1.4.2. Chronic effects: unwanted effects on the reproductive system, liver, kidney and risk of cancer.
- 1.5. In 1977 the American National Institute for Occupational Safety and Health (NIOSH) has recommended to limit exposure to halogenated anesthetic gases then used (methoxyfurane, enflurane, halothan) to a level that does not exceed 2 ppm/ hour. The maximum recommended exposure is still 2 ppm for isofluorane, considered newer and less harmful
- 1.6. The Israeli law limits the exposure to 2 ppm/ eight hours (maximum weighted exposure).

2. Objective

The Technion is committed to ensuring the health of staff and students on its premises by keeping exposure to harmful materials in labs as lower as possible and compliant with the standards set forth by law.

3. Responsibility

- 3.1. The Head of the Preclinical Research Authority is responsible for the implementation of the instructions included in this document.

4. Method

- 4.1. Personal protective equipment:
 - 4.1.1. Nitril gloves
 - 4.1.2. Lab coat
 - 4.1.3. Protective glasses



- 4.1.4. At the laboratory animals facilities add shoe covers, head cover and respiratory masks as needed.
- 4.2. Maintenance of anesthesia systems and equipment (inspection frequency):
 - 4.2.1. Chemical hoods – once a year
 - 4.2.2. Suction systems – once a year
 - 4.2.3. Anesthetic gas vaporizers – at least once every two years
 - 4.2.4. Filter systems with active suction – at least once every two years (such as Fluovac)
- 4.3. Engineering safety controls for minimizing exposure risk
 - 4.3.1. Waste gas scavenger systems and room ventilation will prevent user exposure to high levels of gas vapors. Never use isoflurane without them. Following are details of possible systems:
 - 4.3.1.1. Chemical hood (with standard mark from an authorized institute) – the preferred measure
 - 4.3.1.1.1. Even in the presence of a vaporizer, gas vapors can escape from the animals' respiratory systems and cause environmental exposure to unwanted material levels, therefore hoses must pass through the chemical hood.
 - 4.3.1.1.2. It is mandatory whenever anesthesia is performed inside a container/ jar, where the animal was placed, and not by an exact vaporizer.
 - 4.3.1.2. Local suction systems (suction cups vented through the roof similar to chemical hoods) that can be placed above the release sources during anesthesia.
 - 4.3.1.3. Active filtering systems – filter (active charcoal) contained in a system that actively directs waste gas into the filter – may be used when chemical hood or local suction systems are not available – this solution requires the approval of the Safety Unit. The use of the filter requires monitoring of its weight since its absorption capacity is limited.
 - 4.3.2. Measures for reducing spill and exposure risks – use of bottle adapter for filling the vaporizer to minimize unwanted exposure and spill.
 - 4.3.3. Keep anesthesia systems away from heat or ignition sources (etching instruments, etc) – the oxygen concentration is usually 98% therefore there is a higher risk of fire.
- 4.4. Instructions for safe work with isoflurane when performing anesthesia:
 - 4.4.1. Before starting work with the anesthesia systems ensure the user had attended safety training concerning system and isoflurane use.
 - 4.4.2. Ensure that the isoflurane MSDS and instrument operation instructions are within reach.



- 4.4.3. Fill the vaporizer inside the chemical hood or as described in 4.4.4.
 - 4.4.4. Use an anti-spill adapter for filling the vaporizer to minimize unwanted exposure and spill
 - 4.4.5. Before each use, check the anesthesia system can maintain positive pressure. Identify leakage before use.
 - 4.4.6. Before each use of the anesthesia system check visually the hoses for cracks, defects or damage. Replace plastic tubes at least once or twice a year.
 - 4.4.7. Turn off the vaporizer when not in use
 - 4.4.8. Use nosecones that fit the animal nose and suitable diameter tubes – diameter that allows the surplus gas flow freely back.
 - 4.4.9. Before and after each use of the vaporizer, document the filter/ charcoal canister weight to see if it must be replaced or may still be used (as instructed by the manufacturer). See annex A.
 - 4.4.10. Ensure proper placement of the filter according to manufacturer instructions (depends for example on the filter opening place)
 - 4.4.11. Charcoal filter that reached its maximum absorption capacity (according to weight recording) and isoflurane surpluses must be discarded as chemical waste.
5. Emergency/ exposure incident response
 - 5.1. Eye injury: if the anesthetic gas came into contact with the eyes, use immediately eye washer to flush them for at least 15 minutes while trying to keep them open.
 - 5.2. Skin exposure – in case of skin exposure, remove all contaminated clothes and rinse immediately the affected area with water and soap.
 - 5.3. Respiratory exposure – in case of exposure to gas vapors, move the victim to fresh air area (in case of inhalation seek immediately medical attention)
 - 5.4. In any other case of overexposure notify the Head of the Authority, the Safety Unit (2146/7) and seek medical advice (immediate or preventive).
 6. Documents
 - 6.1. Safety at Work Regulations (Environmental and Biological Monitoring of workers with Hazards, 2011)
 - 6.2. Criteria recommended standard – occupational exposure to waste anesthetic gas and vapors, NIOSH 1977.
 - 6.3. Waste Anesthetic Gas (WAG) Surveillance Program , NIH, 2012

Annex A:

Name of the charcoal filter manufacturer: _____



Filter receipt date: _____

Maximum permitted weight gain (absorption capacity of the filter) : _____ g

Net weight of new filter: _____ g

Maximum permitted weight (maximum final weight): _____ g

Weighing follow-up:

Date	Filter weight before anesthesia (g)	Filter weight on anesthesia completion (g)	Anesthesia duration (hours)	User name